



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/075,433	02/12/2002	Yanbin Shao	13854-009001	8735

26181 7590 06/19/2003

FISH & RICHARDSON P.C.
500 ARGUELLO STREET, SUITE 500
REDWOOD CITY, CA 94063

EXAMINER

JUBA JR, JOHN

ART UNIT PAPER NUMBER

2872

DATE MAILED: 06/19/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/075,433

Applicant(s)

SHAO, YANBIN

Examiner

John Juba

Art Unit

2872

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-17 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-8, 12 and 14 is/are rejected.
- 7) ☒ Claim(s) 9-11, 13 and 15-17 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 22 April 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). ____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____ 6) ☐ Other: ____

DETAILED ACTION

Drawings

The corrected or substitute drawings were received on April 22, 2002. These drawings are approved by the examiner.

Specification

The disclosure is objected to because of the following informalities. Appropriate correction is required: On Page 4, line 3 "fiber 30" should read "fiber 20".

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1 – 7 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claims 1 – 7 recite a "four-port circulator" whereas there is no disclosure of how the disclosed or recited structure can be operated to circulate light from a first port to a second port (but not back), from the second port to a third port (but not back), and from

Art Unit: 2872

the third port to a fourth port (but not back), as would be the accepted meaning of a "four-port circulator". Whether or not isolators (12) and (42) are used, no polarization state of light passes from fiber (40) to either of fibers (20) or (30). Thus, there is no designation of the ports (as 1st, 2nd, 3rd, and 4th) as would cause the device of Figures 2A and 2B or the device of claims 1 – 7 to operate as a "four-port circulator" as recited.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 3, 4, 6, 7, 8, and 12 are rejected under 35 U.S.C. 102(b) as being anticipated by Fukushima (U.S. Patent number 5,999,313). Referring *for example* to Figure 14, the associated text, and the operation described in connection with the three-port device of Figure 2 and 3, Fukushima disclose a polarization splitter ("50" of port 1 in Fig. 3), a first reflector (not labeled, but on the surface of element "46" at port 1 in Fig. 3), a first non-reciprocal device ("56" & "60" coupled to the s-polarized light at port 1), a second non-reciprocal device ("56" & "60" coupled to the p-polarized light at port 1), and a second reflector (at port 2 on the surface of "46" at port 2 in Fig. 3). A "polarizer" (38) is coupled to the first and second non-reciprocal devices. The second reflector is optically coupled to the polarization beam splitter 50 through the non-reciprocal devices (56)(60) and the polarizer (38).

Art Unit: 2872

[Although non-reciprocal assemblies 48(#1), 48(#2), and polarizer 38 fairly constitute an isolator, the circulator does not "further comprise" an isolator, as required by claims 2 and 5.].

With regard to claims 8 and 12, Fukushima anticipates the method steps wherein, at the first port, the first light has s-polarization changed to p-polarization after reflection by the above-identified first reflector, and transmission through the above-identified first non-reciprocal element, whereupon it passes into the second port after passing through a polarizer (38).

Claims 1, 3, 4, 8, and 12 are rejected under 35 U.S.C. 102(b) as being anticipated by Pan, et al (U.S. Patent number 5,689,593). Referring *for example* to Figure 11A, the associated text, and the operation described in connection with the three-port device of Figure 10A, Pan, et al disclose a polarization splitter (132), a first reflector (152), a first non-reciprocal device (142), a second non-reciprocal device (146), and a second reflector (153). A "polarizer" (162) is coupled to the first and second non-reciprocal devices. The first reflector (152) is optically coupled to the polarization beam splitter (132) through first and second non-reciprocal devices (142)(146) and the polarizer (162); second reflector (153) is optically coupled to the polarization beam splitter (132) through first and second non-reciprocal devices (142)(146), the polarizer (162), and the first reflector (152).

With regard to claims 8 and 12, light of a first polarization state is forwarded from a first port (at collimator "112") is forwarded to a polarization beam splitter (132),

Art Unit: 2872

[transmitted through non-reciprocal device "142"], directed to a first reflector (152), reflected [via reflector (153)] to a "first" non-reciprocal device (147) of the second port, changed to a second polarization state, and directed to a second port (at collimator "113") through a "polarizer" (133).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 2, 5, and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pan, et al (U.S. Patent number 5,689,593). As set forth above for claims 1 and 8, Pan, et al disclose the invention substantially as claimed. However, *in the embodiment of Figure 11A*, Pan, et al do not disclose an isolator coupled to the polarization beam splitter or coupled to the first reflector, as variously recited in claims 2 and 5. Nonetheless, in an embodiment relying upon the same polarization beam splitters and non-reciprocal elements, Pan, et al teach that isolation between adjacent ports can be increased by coupling an isolator between the ports in the direction of circulation, as shown in Figure 8 (Col. 10, lines 51-67). Thus, it would have been obvious to one of ordinary skill to include an isolator between adjacent ports in the circulator of Figure 11A, in the interest of improving isolation between the ports, as suggested by Pan, et al.

Art Unit: 2872

In accordance with this teaching, improved isolation between the second and third ports (for example) would have been achieved by placement of the isolator between collimator (112) and the first polarization beam splitter (132), whereby the isolator would have been directly coupled to the first polarization beam splitter.

With regard to claim 5, the isolator would have been optically coupled to the first reflector (152) by way of polarizer (162), non-reciprocal elements (142)(146), and first polarization beam splitter (132).

With regard to claim 14, the additional step of directing light through an isolator is undertaken within the modified circulator.

Allowable Subject Matter

Claims 9 – 11, 13, and 15 – 17 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: The prior art, taken alone or in combination, fails to teach or to fairly suggest in the combination of method steps for transmitting light among first, second, third, and fourth ports, the additional step of forwarding a *second* light signal with the second polarization state from the first port, through a *second* non-reciprocal device, keeping the polarization state of the second signal, and directing the second light signal into a *third* port, as recited in claim 9.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Li (U.S. Patent number 6,487,014) discloses a four-port optical circulator comprising two polarizing beam splitters, two reflectors, and two non-reciprocal rotator assemblies. Each of the embodiments can also be operated as a *polarization independent* switch.

Kokkelink, et al disclose a polarization-maintaining four-port optical circulator employing two non-reciprocal elements.

Krasinski, et al disclose a four-port optical circulator comprising two polarizing beam splitters, two reflectors, two (walk-off) polarizers and a single, non-reciprocal rotator assembly.

Kuwahara discloses a four-port optical circulator.

FUJI ELECTROCHEM CO (JP 11-052297A; JP 09-133894A; JP 09-258136A; JP 09-258135A; & JP 06-324289A) disclose four-port optical circulators.


YAMAICHI ELECTRIC (JP 61-038934 A) disclose a four-port switch comprising first and second reflectors and first and second non-reciprocal elements.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Juba whose telephone number is (703) 308-4812. The examiner can normally be reached on Mon.-Fri. 9 - 5.

Art Unit: 2872

The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9318 for regular communications and (703) 872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.


JOHN JUBA
PRIMARY EXAMINER
Art Unit 2872

June 16, 2003